

Typography in the US Topo Redesign

Elaine Guidero

Pennsylvania State University, Geography—University Park, PA, USA

Abstract. The creation and maintenance of a distinct cartographic identity (in the context of an official map series) contributes to a national identity; cartographic identities are established by map style, one of the most salient elements of which is its typography. At the core, then, of typeface choice in a national map series is the dilemma of establishing a recognizable identity through map design, while allowing the labels and other text to be displayed the same way—to maintain the identity—in different applications. The topographic map redesign team at the United States Geological Survey (USGS) faces some challenges in its attempt to create a map design that establishes a distinct identity, and is legible, while preserving cross-platform compatibility for map users. I explore solutions to creating such an identity in an authoritative national topographic series while satisfying the needs of a wide user base.

Keywords: typography, cartography, national mapping

1. The Construction of Cartographic and National Identity

Wood defined the essence of cartographic identity: “mapped images have become essential to our sense of the world, to our place within it, to much of our identity; to our national identity certainly, but even to our sense of coming from a particular place...to our sense of how we are, of what we’re doing, of where we’re going” (2010: 17). In this paper, I argue that national identity is built through cartographic identity, including both content—what is mapped, generally the sovereign claims of land by a country, but also what is not mapped—and a visual style, or sign system (after Wood 2010).

Cartography in service of nation- and identity-building began in the 1400s with navigational charts for lucrative trade routes, and topographic maps of domestic fortifications or invasion routes, both of which were national secrets (Biggs 1999). Through the Renaissance, maps established the legiti-

macy of European states via their presumed unbiased presentation of the world (Biggs 1999, Harley 2001), although early European mapmaking had only a thin veneer of scientific legitimacy, the practice being “utilitarian...and... ideological...serving national identity-building, colonial, and other interests” (Wood 2010: 22). Maps reified the connection between “land and political power” in the domestic realm (Harley 2001: 118), establishing the primacy of land ownership, and consolidating taxation (and thus, state) authority. When these speakings and silences are incorporated into a national, official map, they establish a certain identity for the country (Harley 2001). This is just as true now with national topographic map series as it was for fifteenth-century portolans.

A map design consists of many elements: line color, weight, and pattern; fill color and pattern; point symbols; generalization; relief representation; and typography (Kent & Vujakovic 2009). Together these form the “cartographic sign system” (Wood 2010: 282), and the sign system is the map’s style and thus its cartographic identity, although Wood asserts that identity cannot be simply reduced to its component stylistic elements—cartographic identity results from the interplay of cartographic signs into a “recognizable whole” (2010: 282). Yet one can pick out component elements, some of which are more visually salient than others (such as brightly colored expressways, relief representation, and typeface). The singular Swiss topographic maps would likely not be as instantly recognizable if the land cover color scheme was altered and the italicized serifs replaced by a roman humanist sans serif.

In a fit of patriotism, Voisin (1976) wrote about maps for “the American people,” that the American spirit of cartography was marked by a lack of a national identity, and that its national map series (by and for government organizations and military branches) were driven by guidelines rather than by a set style. Even at the time of his publication, the production of USGS topographic maps was in full swing; for whatever reasons, these maps neither merited a mention nor constituted a national cartographic identity for Voisin. However, he did note that commercial atlas cartography had a distinct American identity; being the president of Rand McNally, his paper essentially constituted an apologia for commercial atlas cartography. He advocated a unified cartographic style that would immediately establish for the viewer that she or he was looking at an American map. Woodward’s 1982 paper was the first synthesis of map design, typography, and national identity, and he similarly argued that American commercial cartography had a style distinct from Europe, but this is not the same as a national American style—an official American map that speaks for the state and constructs it visually.

2. Typography as a Part of Cartographic Identity

First, a few definitions are necessary. A typeface is a set of characters with the same design. For example, Helvetica is a typeface, and all Helvetica letters have the same “feel.” A font is a single size, weight, and variation of a typeface, e.g., Helvetica Light Italic at 40 points. In a digital context, a font is a computer program, a set of instructions used to render individual letters. A font includes letter outlines created by Bézier curves, which are mathematically defined lines, accompanied by several tables that describe the metrics of the font, such as kerning (Microsoft Corporation 2012). Generally a typeface has one font per weight (e.g., bold, light, book) by variation (e.g., extended, condensed, italic); software scales the sizes appropriately. Typography, as opposed to hand-drawn lettering, is a general term for text created or rendered by machine (Smeijers 1996).

Aside from photography and illustration, nearly every visual product uses type; cartography is no exception. All maps, especially highly detailed national topographic maps, need labels. Albert Kapr, a typographic designer from Dresden, linked typography to national identity through writing. “The form of lettering should be observed with interest for writing is a vehicle of language and thought” (Kapr 1983: 8). “Writing played an important part in the formation of national languages as it stabilized the constantly-changing dialects and anchored them to the main language” (9); language is, of course, the ne plus ultra of systems that encode and transmit national identity. Typography is essential to maps and highly salient, and in a nationally branded map series, the type speaks—it makes the national identity. Additionally, in exhorting type designers to make good typefaces which “make the text legible and transmit emotional impressions as well” (10), Kapr recognized that lettering was an art as well as a trade, and fulfills a dual purpose. Aesthetics are as important as technicalities, and both are equally important in a national cartographic identity.

Map series created by national mapping organizations have their own national style, of which typography is a part. Perhaps the best example is the British Ordnance Survey (OS) maps. The current 1:25,000 design uses Gill Sans, a sans serif typeface designed by British typographer Eric Gill, which closely resembles and was inspired by Johnston Sans, the lettering created by Edward Johnston for the London Underground (Kinross 2002, Woodward 1982) (*Figure 1, left*). The 1:50,000 design uses a custom-made variant of Univers with curved terminals on the lowercase T and L (Woodward 1982) (*Figure 1, right*).

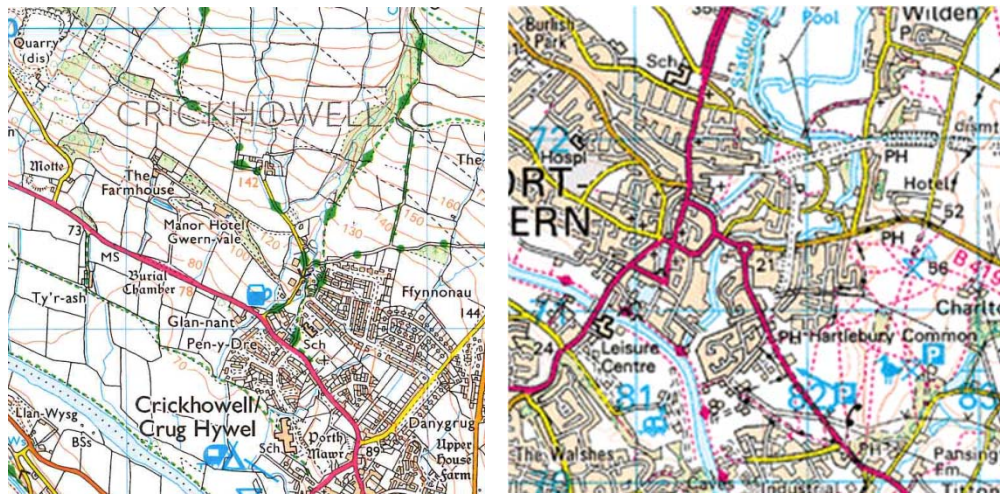


Figure 1. Ordnance Survey maps: left, 1:25,000 (Ordnance Survey 2005); right, 1:50,000 (Ordnance Survey 2011).

These typefaces form part of what seems to be a British transportation design canon: Johnston Sans for the London Underground, Transport, designed by Jock Kinneir and Margaret Calvert (Kinross 2002), for highway signage and for the official UK government website, *gov.uk*, and Gill Sans and Univers for OS maps (Terrett 2012). These distinctly British typefaces, seen in *Figure 2*, create a national visual identity. Arguably little else remains in the OS design that contributes as powerful an identifying mark to the map, despite the numerous cartographic dissimilarities pervasive throughout the London public transport system (Burke & McLaren 1981).

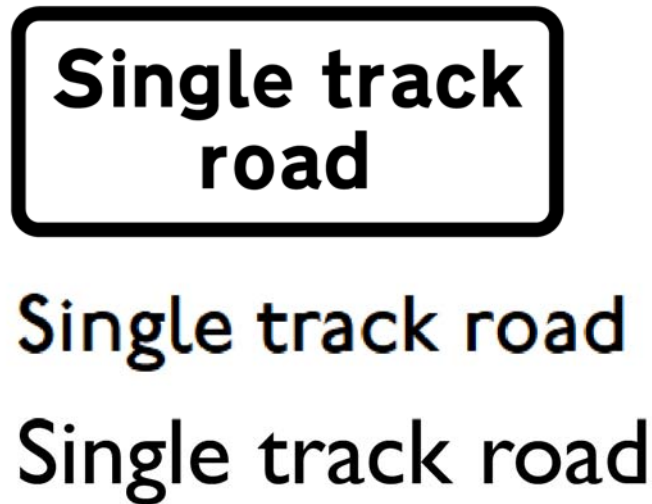
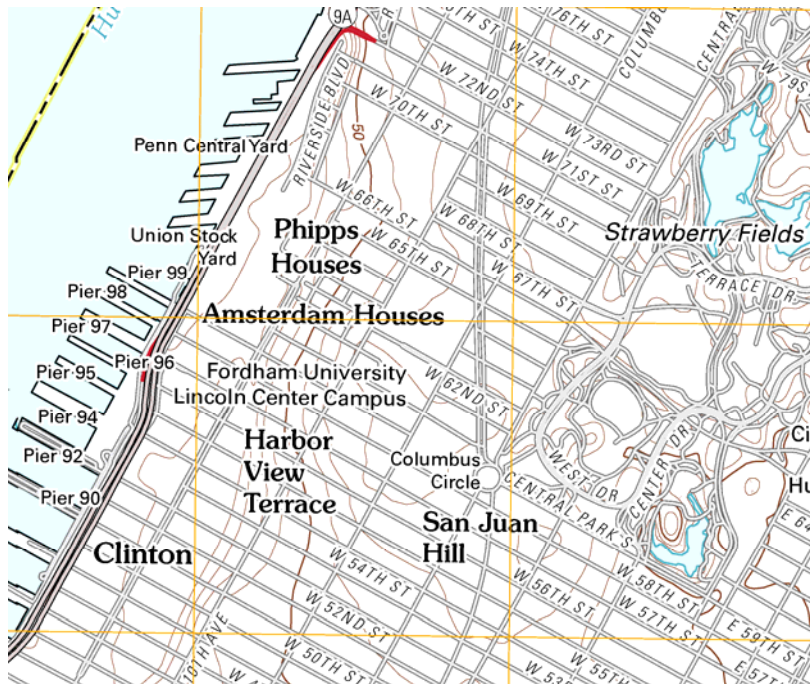


Figure 2. From top to bottom, Transport (Department for Transport 2013), Johnston Sans (Typekit 2013), and Gill Sans.

3. Cartographic and Typographic Identity in US Topo

USGS creates the national topographic 1:24,000 scale map series of the United States and its territories, as part of its mission to “provide reliable scientific information to describe the Earth” (United States Geological Survey 2011). Its current form, US Topo, an all-digital, full-coverage set of 7.5’ x 7.5’ minute quadrangles as geo-tagged PDFs (GeoPDFs), modernized the printed series, which was last redesigned in the early 1970s.

Since the 1970s, the map series used only two typefaces: ITC Souvenir in Light and Demi weights for place names and hydrological features, and Univers in 55 and 56 weights for point features and roads, because they were available in a wide range of weights and printed well (*Figure 3*).



However, Souvenir and Univers are proprietary typefaces, and not distributed with MacOS or Windows. In the 1970s this was not a relevant concern, as the topographic map was a paper map not subject to post-production modification. However, in the twenty-first century, widespread desktop cartography and concomitant changes in technology mean that the map is no longer an inviolate product. The technical justification for choosing these typefaces no longer holds, and there are now thousands of well-designed typefaces that can be employed well in cartographic environments. Beyond technical questions, as Kapr asserted, aesthetics should not be forgotten, especially when a national visual identity is at stake. For one, fonts show their age. Souvenir has so much flair that it is visually tied to a date range; much like another highly artistic typeface, Harlow, which strongly evokes the 1920s and thus is difficult to use in other contexts (*Figure 4*).

Single track road

Single track road

Figure 4. ITC Souvenir Demi (top), Harlow (bottom).

Woodward railed against Souvenir, calling out its “weakness of structure” and “instability of design,” a lack of contrast between thick and thin strokes, and a range of weights “not as useful as it might seem” (1982: 342). His critique was technical as well as aesthetic, with a claim that its “serifs are short and stubby, and they almost disappear when reduced to the smaller sizes, thus making it impossible to aid the structure” (344). More damning still is Woodward’s critique of the typeface with respect to corporate style: “[Souvenir] is almost never used for official documents calling for an authoritative style, and on the contrary is frequently used by large institutions or firms that wish to downplay their authority in a given situation...It is questionable if this image is appropriate for the nation’s official topographic map” (345). Woodward called for more “sensitivity” to typographic issues, urging designers to support the desired corporate (in this case, national) identity, and to be chary of typefaces that would quickly become outmoded (346).

4. Maintaining Identity while Meeting User Needs

In the past few years, US Topo has been redesigned (*Figure 5*). A redesign team for which I briefly worked advocated replacing ITC Souvenir Light/Demi with Georgia, and Univers 55/56 with Trebuchet MS, to solve a number of issues with Souvenir and Univers; our solution has become the next typographic identity for US Topo. Georgia and Trebuchet are legible, support extended character sets for diacritics, and are widely available on MacOS and Windows. Most users will have no trouble displaying labels set in these typefaces, as they will not have to install a typeface.

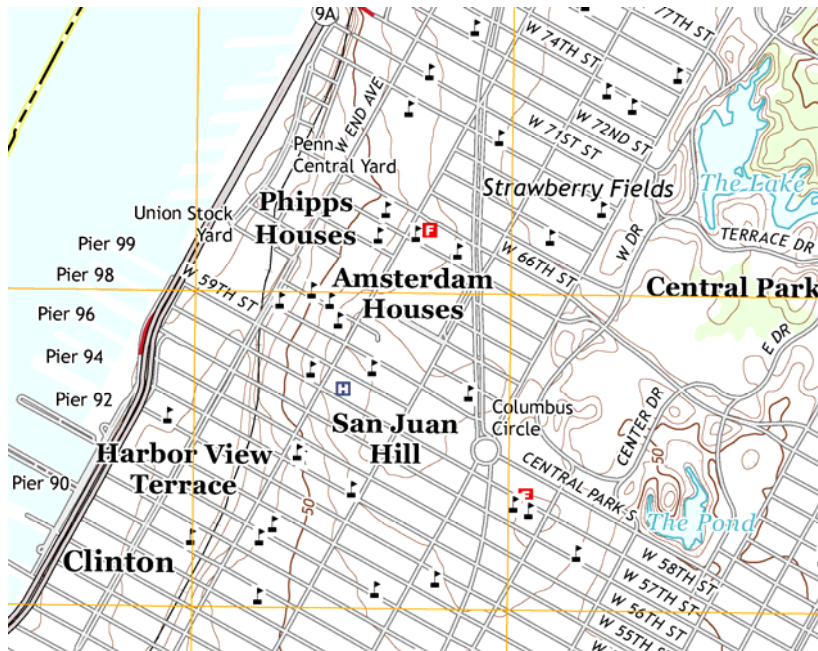


Figure 5. Central Park quad, US Topo (USGS 2013).

Georgia was designed by Matthew Carter in 1996, commissioned by Microsoft to provide a pleasant on-screen reading experience with a serif typeface (Microsoft Corporation 2013a). Many serif typefaces designed for print have small x-heights, and can appear distorted or compressed on-screen at sizes used for body text, 8–16 points. To avoid this, Georgia has a relatively wide character form and high x-height (Microsoft Corporation 2013a). Trebuchet MS, also intended for on-screen use, was designed by Vincent Connare in 1996 of Microsoft (Microsoft Corporation 2013b). Trebuchet has small, curled terminals on the lowercase T and lowercase L, which gives it some character and distinguishes it from other sans serif faces. Trebuchet, like Georgia, has a high x-height (*Figure 6*).

Single track road
Single track road

Figure 6. Georgia (top), Trebuchet MS (bottom).

The combination of Georgia and Trebuchet is not ideal. Although US Topo is now designed to be viewed primarily on-screen, the intensive labeling needs of US Topo are not well served by Georgia. Dense urban areas can have hundreds of point symbols which need to be labeled, along with roads and place polygons. Such labels cannot support a typeface with the dimensions of Georgia. Both Georgia and Trebuchet are somewhat generic typefaces, simply because they are widely distributed as part of the default set of installed fonts on every Macintosh and Windows operating system since 1999. Such a widespread typeface dilutes the identity of any design using it. Part of the reason the OS maps are so recognizable is that the typeface is specific to the map. The British custom variant of Univers is not used on millions of websites. OS does not distribute their custom typeface, but they also do not provide free, large-scale topographic maps to the extent that the USGS does.

The geological science community, a significant portion of the USGS user base, uses GeoPDFs as basemaps, in lieu of constructing their own maps from downloadable data. They layer geologic data on top of the GeoPDF, and separate the individual data layers of the GeoPDF to add new labels, remove symbols, and perform other modifications. This is not a common usage of GeoPDFs, but this particular user community has specifically requested that USGS continue to supply GeoPDFs that can be used in such a way. Unfortunately, this usage precludes the use of any typeface other than the most widely available, generic typefaces. To explain why requires some definition of font embedding and permissions. Font embedding is the technology that allows fonts to be saved inside a document. When the document is sent to a remote user that does not have that font installed on their computer, the embedded font can be installed temporarily or permanently on the remote user's system to allow correct viewing of the document (Microsoft Corporation 2012). Permissions are the rights that specify the level of installation on the remote machine from the document.

There are four basic levels of permissions: Installable, Restricted License, Preview & Print, and Editable (Microsoft Corporation 1995; Microsoft Corporation 2011). *Installable* means the font is fully and permanently installable on the remote system. *Restricted License* fonts "must not be modified, embedded or exchanged in any manner without first obtaining permission of the legal owner;" *Preview & Print* fonts "may be embedded, and temporarily loaded on the remote system...no edits can be applied to the document;" *Editable* fonts "may be embedded but must only be installed temporarily on other systems...documents containing Editable fonts may be

opened for reading, editing is permitted, and changes may be saved” (Microsoft Corporation 2011). OpenType fonts also allow *bitmap* embedding, in which only the images of the letters are embedded; the font itself is not embedded and cannot be used to generate further text (Microsoft Corporation 2011).

The challenge facing USGS is how to maintain an identity while reasonably meeting the needs of its users. In choosing a solution, USGS must identify how far it wants to go in serving the public, or even the requests of just one user group. But, as a public institution, USGS has a responsibility to its user base to provide them with “scientific products that lead to solutions,” including cartographic data (USGS 2011).

5. Solutions

The problem can be approached in two ways: changing the way USGS meets user needs, or changing technology. In the first approach, USGS can influence how people use US Topo by educating them about the data delivery services that it already offers, so that users can construct their own US Topo basemap in GIS software, modifying for their needs as they wish. However, this approach is a bit cold-hearted. US Topo maps are convenient and simple and ready to download; why not allow users to add data to them, as needed? Thus it makes sense to address this from a technology perspective.

A common solution is to embed a custom or proprietary typeface in the GeoPDF. At first this seems simple; when the user imports the PDF into design software to pick apart the layers and generate new labels, s/he can simply use the embedded type. The problem here is the jump from the GeoPDF to the design software. A typeface that could be used in such a way, packaged with the GeoPDF but usable in another program, would need an installable embedding permission. For USGS to license a typeface that would theoretically be distributed with full rights to anyone anywhere in the world who wished to download it, USGS would essentially need to purchase a worldwide multi-million-user font license. This is financially infeasible. And, font embedding at the more common editable or preview & print levels does not allow the end user the flexibility to create new labels that would match the national cartographic identity.

Rarely are commercial fonts distributed with an installable embedding permission. Georgia and Trebuchet, two of the most widely available Microsoft typefaces (distributed with Microsoft Windows XP and later versions, and Microsoft Office 2000 and later) are editable, not installable. Unless the user already has them installed (which is highly likely), these fonts will not be usable outside the GeoPDF. USGS has assumed that most

users, especially the geological sciences users, are running a Microsoft operating system, or have a Microsoft product installed, giving them the ability to use the fonts specified in US Topo. While it is probably a safe assumption, it shows that even the current system of embedding a typeface in the GeoPDF and hoping the end user will have the appropriate font already installed, is somewhat flawed.

If the emphasis is on keeping a custom typeface in the map, one possible solution is to turn the typeface into vector objects or bitmap images. If the font is no longer a series of instructions that can be used to display text, but is instead an image, the copyright issues disappear. Of course, the user will not be able to make changes to the text at all, and further labels will be constructed in a font arbitrarily substituted by the operating system, adulterating the visual identity of the map.

These solutions introduce hurdles for the end user or USGS. I propose three feasible solutions. The first is to turn to open source fonts. An open source font with a GPL license eliminates all copyright restriction and embedding problems. While it introduces the problem of the user needing administrative rights on their computer to install the typeface, keep in mind that very few people intend to use the GeoPDF in such an extended usage. Those not wishing to take apart the data layers from a GeoPDF will be able to view the map as it was originally intended using existing font embedding technology, without having to actually install the typeface.

However, perhaps it is worthwhile to consider going beyond fonts, and to rethink the idea of a national cartographic identity. Is it possible, or desirable, for a national mapping organization to establish a cartographic identity despite using regular typefaces, saving identifying marks for other cartographic elements (using line style, for example) or for the map collar and other perimap elements, the paraphernalia and information surrounding the cartographic content (Wood & Fels 2008). As long as the other cartographic elements are styled well, this could work. But if all custom typography is relegated to the perimap, or doesn't exist at all, then the mapmaker falls into the trap of a generic map style. The perimap will not always be included with the map when it is redistributed. GeoPDFs are fairly large, and printing at full size including the perimap requires a plotter. Screenshots and printouts of portions of the map are more common ways of distributing the map. In this case, the identifying mark of the national mapping organization will be lost to the end user.

Finally, I take the example of Ordnance Survey. They offer on their web-service the official print version, complete with custom fonts, as an uneditable underlay. It can be printed or saved, or data can be added on top of the map, such as routes or markers, but there is clearly no attempt to pro-

vide a capability like the GeoPDF. It seems that there is little concern for whether user-added labels will change the identity of the map—perhaps because the identity is already quite strong. A similar solution for USGS would incorporate a well-designed custom typeface that cements map style and thus the national identity, with continued production of GeoPDFs, but with the entire map, or at least some essential layers, as an unchangeable basemap. Additional labels could be set in a generic typeface that matches the custom design, and as the OS example shows, that may not detract too much from the cartographic identity.

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